# GEMS Newsletter

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1. **Who Do I Contact?** Budget cuts have reduced the number of staff available for assistance uploading data into our Groundwater and Environmental Monitoring System (GEMS) database. **While we're in transition, here is a list of contact people for general GEMS questions, and for information on specific facility submittals.**

   When mailing electronic data, accompanying Environmental Monitoring Data Certification Form, and Exceedance Notification Reports, send to this **official address** rather than to individual staff members.

2. **GEMS Updates and New Data Certification Form** Article includes: Problem submittals and the New Data Certification Form. Why data that fall exactly at the Limit of Quantitation (LOQ) should not be flagged with a "J." New parameter codes for elevations. A caution regarding the comma-delimited format.

3. **New on the Web** Two new Waste Management publications are now available on the Web: One on reducing/eliminating groundwater monitoring at small, closed landfills; the other, a final report evaluating the value of testing for COD at landfills, conducted by DNR and UW-Stevens Point. Also new – an update on our efforts to provide WEB access to the GEMS database.

4. **Time to Drop COD?** We're now recommending that municipal solid waste facilities formally eliminate COD from their groundwater monitoring programs. Other facilities may also be candidates. Read the full article for a history of this decision and more information...

5. **Pesticides at Landfills - Study Update**... DNR staff have recently completed the sampling phase of an EPA funded pesticide study of pesticides at landfills. This study targets Wisconsin pesticides rather than "Subtitle D" pesticides. Read below for more...

6. **Moving towards GIS Compatibility** A request for additional supporting information to go along with monitoring well location data. The additional information will allow staff to manage, display, and communicate locational information in a GIS format. Request for volunteers to help evaluate electronic submittals for plan sheet information...

7. **The Mystery of Tetrahydrofuran Data** Puzzling facts about THF results, unknown THF sources, how THF results can affect facilities, help needed...

# GEMS Updates

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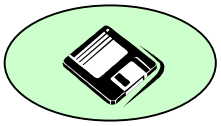
## *Problem Submittals and the New Data Certification Form*



Help us avoid problems with the GEMS data submittals! The GEMS-upload staff have identified one common problem that, if fixed, will save time for us all -- data submittals for multiple landfills that are included in one file on a GEMS submittal disk. Please be certain that you or your consultants do not submit data for more than one facility or license number in one file. To help correct this recurring problem, we have modified the data certification form that accompanies each data submittal. Each data submittal for a given facility will require a separate certification form. So, if you submit data for multiple facilities on one disk, be sure to include a separate file on the disk for each license number, and include a separate certification form for each license number.

The new data certification form will be available after January 1, 2004 on the Waste Management Program website under environmental monitoring downloads at **http://www.dnr.state.wi.us/org/aw/wm/monitor/Downloads/.** Scroll down until you find 'EM-Cert-Form' as either a Word or PDF file. The current data certification form has a 06/28/02 date in the "Date modified" column; the updated data certification form will have a 2004 date.

To reduce paperwork and filing space, we will no longer maintain separate Solid Waste files in the DNR Central Office and in the Regions. In the future, please send the GEMS data submittal disk, along with only one copy of the data certification form(s), and summary/exceedance reports to the **official address** for uploading and filing purposes. Unless specifically requested by an assigned hydrogeologist, do not send copies of the certification forms or summary/exceedance reports to other Waste Management staff members or to the regions. After Central Office staff upload the GEMS data, they will forward the data certification forms and summary/exceedance reports to the assigned regional staff for review and filing. On the new data certification form, we have eliminated the check-box indicating that a copy has been sent to the region office.

If you are contacted about a "problem" disk and it's necessary to resend it, please check the "resubmittal" box on the new data certification form.

Thanks for all your past and future help facilitating the upload process for GEMS data submittals, the uploading times have become shorter and shorter since 1996 when we began the electronic submittal process!

## *Official Address for Sending Data Submittals*

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For United States Postal Service mail send to:

GEMS Data Submittal Contact – WA/3
Bureau of Waste Management
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

For FedEx, UPS, hand deliveries, etc. send to:

GEMS Data Submittal Contact – WA/3
Bureau of Waste Management
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53702

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## *Data at the LOQ*

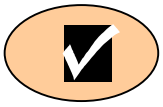
Waste Management Staff have noticed that facilities, consultants, and laboratories are using different conventions when reporting analytical results that fall exactly at the Limit of Quantitation (LOQ). Sometimes these results are flagged with a "J." **Results equal to the LOQ should not be flagged with a "J."** [Chapter NR140.16(5) Wis.Adm.Code states that "if a substance is detected *below* the limit of quantitation, the owner or operator shall report the detected value with the appropriate qualifier."]

It is important that whoever prepares the data submittal adjust their reporting practices so that results at the LOQ are not "J"-qualified. To make sure data are correctly loaded into GEMS while allowing facilities time to convert to this new procedure, GEMS will automatically remove the "J" flag on results equal to the LOQ before loading into the database temporarily.

Though at first it might seem that instances of analytical results falling exactly at the LOQ would be an uncommon occurrence, a search of the GEMS database showed us that it is relatively common. For regulatory purposes this poses a problem because "J"-flagged results are excluded from GEMS compliance screens and calculations.

When we investigated laboratory reporting conventions, we identified two causes for qualifying data at the LOQ. We found that the BETWEEN function in some standard software systems (e.g. Oracle databases) includes values at both extremes of the range. Therefore, values equal to the LOQ were being inappropriately "J" flagged electronically. In another case, results were qualified prior to rounding the results for significant figures. We notified laboratories of the issue in the spring 2003 edition of *LabNotes*, the laboratory certification newsletter, and encouraged them to review and update their practices for qualifying data at the LOQ as necessary.

## *New Parameter Codes for Elevations*



Summarized here and listed on the Waste Management website at:
http://www.dnr.state.wi.us/org/aw/wm/monitor/Downloads:

- New elevation parameters (in feet above Mean Sea Level):

| | | |
|---|---|---|
| Groundwater Elevation (formerly 72020) | parameter code | 04189 |
| Land Surface Elevation (new) | parameter code | 99422 |
| Leachate Head Elevation (new) | parameter code | 99423 |
| Surface Water Elevation (new) | parameter code | 99520 |

Important: Please take special note of the new parameter number for 'Groundwater Elevation' since it is so frequently measured and reported. For reporting elevation data collected from staff gauges that are used to measure surface water, please use the new code for 'Surface Water Elevation.'

- Miscellaneous parameters:

| | |
|---|---|
| Leachate, Volume Recirculated (1000 gallons): | parameter code 99723 |
| Toluene (formerly 78131) | parameter code 34010 |
| Air Temperature, ambient (formerly 00021) | parameter code 00011 |

You can find the most current list of replacement parameters on the Waste Management Website, and to compare old and new parameter codes, look for the entry: "OLD-NEW_PARM_COMPARE.CSV."

## *Caution Regarding the Comma-Delimited Format for GEMS Data*

After saving electronic monitoring data from MS Excel into the *.csv (comma-delimited) format for submittal on diskette, it is imperative that the data manager or other user does NOT open or view the *.csv output file with MS Excel. If the *.csv file is opened with MS Excel, the leading-zeros in front of dates are automatically stripped off. These leading-zeros are necessary in order for GEMS to properly recognize the data.

If you wish to view the data in the *.csv file, without making any changes, open the document with Notepad by right-clicking on the icon, and then selecting "Open with" or "Send to" the Notepad program. ✯

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# On the Web …

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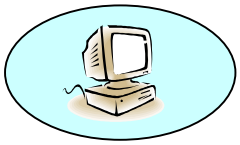
## *New Publications*



Two new documents relating to environmental monitoring at landfills have been put on the DNR Waste Management website. One document, found at http://www.dnr.state.wi.us/org/aw/wm/publications/monitoring/CODReportFeb2002.pdf is the final Chemical Oxygen Demand (COD) report summarized elsewhere in this newsletter (COD article). The report, produced by DNR staff and researchers at UW-Stevens Point, details problems associated with using COD as an indicator parameter for landfill contamination, and gives recommendations for requesting elimination of COD from a landfill monitoring program.

The second new publication is a guidance document that provides background information for facilities and consultants for reducing groundwater monitoring, or eliminating it entirely (in rare cases), at small, closed solid waste landfill. The reducing monitoring document can be found at: http://www.dnr.state.wi.us/org/aw/wm/publications/monitoring/ReducingGWM.pdf.

## *GEMS on the Web – Update*

We are striving to provide our customers with access to GEMS via the Internet, and have currently developed a GEMS module that will provide access to one facility's data at a time. We're hoping that this module will be available in spring, 2004. Users will then have the ability to view and download groundwater, gas, leachate and lysimeter data into a variety of formats.

The GEMS interface will be similar to the database for the Crandon mine, which you can access at: http://prodmtex00.dnr.state.wi.us/pls/inter1/crandon$.startup. If you look at that site, please be aware that while the Crandon database is for one facility, it includes results for many sampling sites and waterbodies. We plan to develop a second GEMS module that will provide access to data from multiple sites (for example, data for well samples from all the licensed facilities on a particular property) sometime in the future.

The Drinking Water and Groundwater program currently provides indirect access to GEMS sampling results for groundwater monitoring wells and water supply wells. If you know the Wisconsin Unique Well Number (WUWN) for a particular well, you can access the results using the Groundwater Retrieval Network (GRN) database, found at http://prodmtex00.dnr.state.wi.us/pls/inter1/grn$.startup. GRN also allows you to search for wells located in a particular area using Public Land Survey (Town, Range, Section) information. GRN is updated from GEMS approximately once a week, so there is a lag time between data being uploaded into GEMS and its availability on GRN. Monitoring results from devices that monitor landfill leachate, lysimeter fluid, gas, etc. are not available through GRN, because those monitoring points do not have WUWNs.

Although we may not be able to address them at this time, if you have ideas or specific needs that you would like to see incorporated into the second GEMS Internet module, please contact Barb Hennings at Barbara.Hennings@dnr.state.wi.us with "GEMS web interface" in the subject line of the message. ✯

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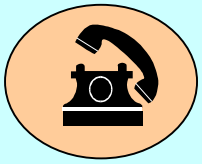
# WHO DO I CONTACT?



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## General Questions:

*Data Upload:*

Matt Silbernagel (608) 267-0546 [pre-1/1/2004] Matthew.Silbernagel@dnr.state.wi.us

Wayne Ringquist (608) 266-08677 [post-1/2004] Wayne.Ringquist@dnr.state.wi.us

*Data Formatting:*

John Sissons (608) 267-7567 [post-1/1/2004] John.Sissons@dnr.state.wi.us

*Newsletter/Data Quality/Lab Methods:*

Janet Battista (608) 267-3533 Janet.Battista@dnr.state.wi.us

*NR 140 Groundwater Standards:*

Barb Hennings (608) 264-6021 Barbara.Hennings@dnr.state.wi.us

*Backup Contact for GEMS/Environmental Monitoring*

Jack Connelly (608) 267-7574 Johnston.Connelly@dnr.state.wi.us

## Regional Program Assistants:

*GEMS information, Facility staff assignments:*

*Northeast Region*:

Diane Hammel (920) 492-5866 Diane.Hammel@dnr.state.wi.us

*Northern Region:*

Susan Sutton (715) 635-4051 Susan.Sutton@dnr.state.wi.us

*South Central Region:*

Kathy Warren (608) 275-3289 Katherine.Warren@dnr.state.wi.us

*Southeast Region*:

Sylvia Rosenbaum (414)263-8678 Sylvia.Rosenbaum@dnr.state.wi.us

*West Central Region:*

Sue Brumberg (715) 839-3734 Susan.Brumberg@dnr.state.wi.us

## Other Programs:

*Laboratory methods and data quality:*

Lab certification (608) 267-7633 labcert@dnr.state.wi.us

*Wisconsin Unique Well Numbers for private wells:*

Judy Gifford (608) 266-0153 Judy.Gifford@dnr.state.wi.us

*Wisconsin Unique Well Numbers for monitoring wells and NR 141 questions (Monitoring Well Requirements):*

Dave Johnson (608) 261-6421 David.Johnson@dnr.state.wi.us

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# Time to Drop COD?

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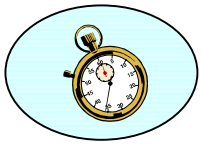

The Waste Management Program is now recommending that municipal solid waste facilities formally eliminate Chemical Oxygen Demand (COD) from their routine groundwater monitoring programs. Other types of facilities, such as fly ash landfills, may also be candidates for eliminating COD. See the recommendations section and text box below for specifics and more information. If you believe your facility may be a candidate to drop COD, contact the DNR hydrogeologist assigned to your site for information about requesting an expedited plan modification to drop COD.

## *History*

For several years, DNR has considered dropping chemical oxygen demand (COD) from groundwater monitoring programs. Hydrogeologists in the Waste Management Program had reported that COD data were often erratic and unpredictable, and that COD was not useful as an indicator of groundwater contamination. Independently, we learned from staff chemists that the standard COD analytical test method generates significant volumes of hazardous waste containing mercury, chromium and silver at analytical laboratories.

DNR enlisted staff at the University of Wisconsin – Stevens Point (UWSP) for help in evaluating COD results at various types of landfills. DNR staff and researchers at UWSP collaborated on the COD investigation and follow-up report that can be found at http://www.dnr.state.wi.us/org/aw/wm/monitor/guidance/CODReportFeb2002.pdf. on the DNR website.

Some of the study findings:

- inorganic parameters such as alkalinity, hardness, and conductivity were equal to or

**COD Recommendations by Landfill Type**

- For **landfill expansions or new facilities**, include DOC in baseline monitoring either in addition to or in lieu of COD. Depending on landfill type, propose monitoring DOC and/or VOCs in a feasibility report or plan of operation.
- At **municipal landfills with routine VOC monitoring**, submit a formal or expedited plan modification request to eliminate COD.
- At **municipal landfills without VOC monitoring**, substitute VOCs for COD in groundwater wells by submitting a formal or expedited plan modification.
- At **fly ash or bottom ash landfills**, review historical COD data. If COD is not useful, eliminate COD monitoring for groundwater wells by submitting a formal or expedited plan modification.
- At **paper mill, foundry, other industrial or demolition landfills with routine VOC monitoring**, review your COD monitoring data. If COD has not been useful, eliminate COD by submitting a formal or expedited plan modification.
- At **paper mill, foundry, other industrial or demolition landfills without VOC monitoring**, review the historical COD data. Where there is no indication of groundwater contamination or where the COD is not useful, substitute DOC for COD by submitting a formal or expedited plan modification request.

better than COD as indicators of inorganic contamination, such as high salt and heavy metals concentrations,

- a scan for VOCs was better than COD in finding organic contamination,
- dissolved organic carbon (DOC) was better than COD as an indicator of organic contamination,
- COD may be useful for predicting groundwater contamination at some industrial landfills,
- non-standard COD analytical methods were inferior to DOC as a replacement for standard COD methods.

## *Recommendations*

We recommend that facilities and consultants review the historical record of COD at their sites to determine whether to keep or eliminate COD. Contact the hydrogeologist assigned to the facility to discuss how best to request changes to an existing plan of operation, or whether to eliminate COD for a proposed new facility or expansion. See box for general recommendations by landfill type.

If you are concerned about losing historical trend information, consider monitoring for both COD and DOC for a few monitoring rounds before eliminating COD.

## *Important Notes:*

The above recommendations apply to groundwater monitoring only. Further research is needed on the usefulness of COD for monitoring leachate.

Note also: Expedited plan modifications cannot be used for demolition landfills. ✯

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# Pesticides at Landfills - Study Update

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You may have heard about the ongoing pesticide study being conducted in the Waste Management Program. The study was designed to evaluate the presence of eleven pesticides and their metabolites plus two pesticide VOCs in groundwater and leachate at selected, closed municipal solid waste landfills. In addition, we evaluated two analytical methods: immunoassay for pesticides, and a more sensitive drinking water method for the analysis of 1,2-Dibromoethane (EDB) and 1,2-Dibromo-3-chloropropane (DBCP).

**Pesticides in the Study**

Alachlor
Aldicarb
Atrazine
Carbofuran
Chloropyrifos
Cyanazine
Diazinon
Metolachlor
Metribuzin
Simazine
2,4-D

## *Immunoassay Screening for Pesticides*

Pesticides are not routinely monitored in groundwater at landfills. The Appendix 2 list for assessment monitoring at Subtitle D wells does contain some pesticides, but these are not commonly used in Wisconsin. Priority pollutant lists for leachate detection monitoring also contain pesticides little used in Wisconsin. Except for 2,4-D, the most commonly used Wisconsin pesticides are absent from required monitoring lists. By using relatively inexpensive immunoassay tests, we conducted a rapid screening of groundwater and leachate samples for eleven common Wisconsin pesticides.

**Immunoassay: What is it?**

Unique, specifically created antibodies bond with their chemical analogs in a sample causing a measurable colorimetric change in the sample, if the chemical is present.

Results from this study will help us decide whether to petition EPA to modify Appendix 2, and whether the immunoassay method is a useful screening tool for assessing to presence of pesticides, and some of their metabolites.

## *EPA Method 511 in EDB and DBCP Analyses*

Although EDB and DBCP are routinely monitored at landfills whenever a VOC scan is required the approved methods are not sensitive enough to detect EDB and DBCP at concentrations near Wisconsin groundwater standards, that is, at levels of health concern. Investigators used a drinking water method, SW 846 EPA Method 511, with detection limits below the groundwater standard levels to assess whether EDB and DBCP were really present and would justify the added expense of the more sensitive test.

## *Methods*

Our staff selected eleven, closed landfill sites, located in four of the five DNR regions based on several criteria, most important, a history of VOC contamination during recent routine monitoring events. Sites with existing VOC contamination were considered most likely to have pesticides, and/or EDB or DBCP, present. In addition to past contamination, the selected landfills had a readily identifiable background well to provide groundwater quality information about groundwater quality unaffected by the landfill. The sampling was performed in conjunction with routine monitoring activities at the landfills and was conducted between early March and late June 2003.

Immunoassay methods were used because the tests provide a relatively inexpensive, rapid, and sensitive analytical method of screening. Because EPA does not approve immunoassays for groundwater analyses at solid waste sites, results from the tests have no direct regulatory impact. Samples with higher pesticide concentrations were analyzed a second time by more traditional pesticide methods.

## *Preliminary Findings*

Preliminary results indicate that immunoassays have excellent potential as a screening tool for pesticide analysis. The State Laboratory of Hygiene immunoassay results suggested the presence of low-level concentrations of numerous pesticides in groundwater at several of the landfills, and GC/MS analyses conducted by the Department of Agriculture, Trade, and Consumer Protection confirmed their presence. Neither EDB nor DBCP was detected in any of the samples tested. This suggests that a regulatory policy of requiring a second VOC analysis for EDB and DBCP, as part of routine detection monitoring, may be unnecessary. Background monitoring wells did not show pesticide contamination, indicating that complications from agricultural sources of pesticides did not materialize.

The report should be available sometime in the spring of 2004. Watch for it on the DNR Waste Management website under Environmental Monitoring Publications. ✯

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# Moving towards GIS Compatibility

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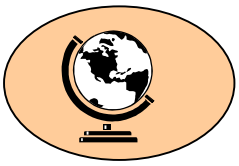

Waste management facilities submit significant amounts of locational information to the Department including coordinates of monitoring wells, and drawings showing limits of waste. Some of this information is submitted on paper forms, some in plan sheets and some electronically. Ultimately, we hope to consolidate all the landfill locational information into the Department's geographic information system (GIS) database. However, to accomplish this we need more specific information about the locational information we receive.

As a first phase, we are requesting that facilities submit electronically the information described below whenever a Well Information Form (WIF) is sent to the Department. To begin the second phase, we are initiating a volunteer pilot project to determine the feasibility of having facilities submit plan sheets in an electronic format.

**Data Fields for Phase 1 Locational Information**

1) **Facility License/Monitoring Number:** The five-digit number assigned to each (proposed) facility by the Department.
2) **Monitoring Point ID:** The three-digit GEMS identification number for the monitoring point.
3) **Monitoring Point Name**: The common name such as MW-1 or OW-1. (A secondary check for ensuring that locational data is assigned to the correct point.)
4) **Northing Coordinate:** The northing, or 'Y', coordinate to appropriate precision.
5) **Easting Coordinate:** The easting, or 'X', coordinate to appropriate precision.
6) **Coordinate System**: Only the following commonly recognized coordinate systems should be used to provide exact monitoring site locations: Wisconsin Transverse Mercator (WTM), Universal Transverse Mercator (UTM), State Plane (SP), County System, and Latitude/Longitude **in decimal degrees only**.
7) **Coordinate-system Zone**: Where necessary, the zone for the specific coordinate system must be included (applies to UTM, SP, and County).
8) **Datum**: The datum provides essential information regarding the coordinate system origin and must be included. The current datum being used by the agency for WTM is NAD 83/91 (North American Datum, corrected 1983/1991).
9) **Units:** The units used for the coordinates are essential information for understanding the coordinate data. The standard units used by the agency for WTM 83/91 is meters.
10) **Collector:** The name and affiliation of the person who collected the locational data.
11) **Date**: The date on which the locational data was collected.
12) **Method**: The method used to collect the locational data – survey, GPS-recreational, GPS-mapping, GPS-survey, digitizing, or other. (At this time, the only locational data collection methods for monitoring wells that we believe meet the requirements of chapter NR 141 are standard surveying and GPS with survey grade instrumentation.)
13) **County**: The county in which the monitoring point is located. (Can be used as a secondary check on location.)
14) **Public Land Survey Information:** The township, range, section, and quarter-quarter section. (Can also be used as a secondary check on location.)

## *Background*

The coordinate information for monitoring points located in GEMS is a key set of locational data. Currently however, the GEMS locational data is limited to northing and easting coordinates for monitoring points that are submitted on either WIF forms or Monitoring Well Construction forms. Sometimes the name of the coordinate system is included with the coordinates, but often it is not. Waste Management staff enter manually the coordinates and coordinate system name, if provided, into GEMS from the forms.

Unfortunately, the GEMS data are largely unusable for GIS purposes due to the lack of necessary supporting information. For example, we have not historically required that the coordinate system datum, zone, and other necessary information accompany the coordinates. This lack of necessary background information makes it impossible to convert each of the numerous coordinate systems in use to the Department's standard coordinate system - Wisconsin Transverse Mercator (WTM). Our

goal is to convert all locational data to WTM so that we can manage data within the Department's GIS format.

We determined that for point coordinates already in GEMS, it would not be possible to obtain the necessary background information. However, by requesting all the supporting information along with the coordinates when new monitoring wells are installed at active, new and expanded landfills, we hope to begin the process of quickly and effectively managing locational information within the GIS framework.

A brief survey of some of the landfill consultants, facility managers, and local government officials revealed an overwhelming interest for our customers to retain the ability to use a variety of coordinate systems when locating monitoring points and when delineating landfill boundaries. As a result, we have decided to continue to accept the use of any of the commonly recognized coordinate systems, provided all the necessary associated information is submitted along with the basic coordinates. As a reminder, locational information that is based exclusively on a local site grid system will no longer be acceptable.

In early 2004, the Waste Management Program will be requesting permission from the Natural Resources Board to begin the process of initiating code changes to update the solid waste administrative codes. If approved, we anticipate requiring the electronic submittal of all the necessary additional information, described above, for locating environmental monitoring points, such as wells and probes, along with electronic versions of plan sheets.

## *Submittal Format*

At this time, we are requesting that active and new waste management facilities submit a diskette or CD containing a spreadsheet organized into14 required data fields (see box) to accompany all WIF submittals. Excel, Lotus, and Quattro Pro spreadsheets are acceptable for organizing and submitting the data. In order to make the process easier, information provided in coordinates other than WTM will be converted to WTM, for our GIS use, by Department staff using programs developed at the Department.

## *Pilot Study*

We currently collect several additional sets of landfill locational information, usually recorded on plan sheets, with every major submittal we receive. These include Feasibility Reports, Plans of Operation and Site Investigation Reports. We are considering options for collecting plan sheet information electronically along with appropriate coordinate information. Currently, nearly all maps, plans, and plan sheets were originally generated electronically, most likely using one of the recognized coordinate systems listed above. If facilities submitted their maps, plans, etc. to the Waste Management Program electronically, along with the coordinate information above (Items 4-14), we could begin to manage the spatial data electronically in GIS. We could then make the plans available to staff on their PCs, and begin to use them in a coordinated manner for policy making. We are interested in an assessment of your ability to provide that information to us, and in starting a pilot project addressing electronic plan sheet data transfer in the near future. Please contact Chris Carlson at 608/267-0856 or Christopher.Carlson@dnr.state.wi.us with your comments or to volunteer to be part of the pilot project. ✯

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# The Mystery of Tetrahydrofuran

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For some time, Waste Management hydrogeologists have quietly puzzled over groundwater and leachate data for Tetrahydrofuran (THF) at landfill sites. Now we are on a mission to find out what is really going on. First, we will conduct a literature search to discover whether THF is known to occur as a landfill contaminant in other states and whether unexplained groundwater concentrations of THF have been investigated before. After a thorough literature search, the GEMS database will be screened in various ways to determine whether there is any correlation among various parameters and THF, for example, between THF and particular analytical laboratories, the age of monitoring wells, and landfill location.

## *Puzzling Facts...*

- high concentrations of THF have been reported from samples collected at landfill groundwater monitoring wells that do not show any other evidence of contamination
- there may be little or no evidence of THF occurring in leachate at a landfill having THF in groundwater monitoring wells
- sometimes THF occurs in leachate, sometimes not
- THF sometimes appears in groundwater wells located some distance from the known limits of waste, in an upgradient direction, or in an isolated deep piezometer
- THF results are often erratic, inconsistent
- THF may appear in samples analyzed by one laboratory at vastly different concentrations from samples analyzed by another laboratory

THF from PVC glue?

The source of the THF is mysterious. It is known that PVC glue, once used in the construction of monitoring wells, is comprised largely of Tetrahydrofuran. However, administrative rules have not allowed the use of PVC glue in the construction of monitoring wells since 1988. Also, wells constructed without PVC glue have shown THF detections. We also know that PVC solvent-based glue is currently used in the construction of leachate lines, lysimeters, manholes and landfill liner boots, etc. at engineered landfills. However, THF also appears to occur at landfills lacking such engineering structures.

THF in the waste stream?

In addition to PVC glue, THF is used in numerous products and coatings including coatings for magnetic tape, vinyl films and cellophane, and in printing inks and toners. THF is also used in the chemical industry as a reaction solvent and intermediate in the production of other chemicals. Some analytical laboratories may use THF in the process of gel chromatography. Despite its widespread use, it appears unlikely that THF would occur in the waste stream for a typical Wisconsin municipal solid waste landfill in concentrations great enough to cause the high levels of THF found in groundwater at some facilities.

## *How Can THF Results Affect a Facility?*

Having THF in a well can present serious problems for facility owners. If THF occurs in a landfill monitoring well at concentrations that exceed groundwater standards, a facility may be required to investigate the source and possibly initiate a groundwater clean-up. THF may interfere with the siting process if it is found in samples from wells at the site of a proposed new facility, or in samples from wells associated with an existing landfill located next to a proposed new landfill or landfill expansion. Also, exceedances of groundwater standards in samples collected at a Subtitle D groundwater well would trigger assessment monitoring. [THF has a Preventive Action Limit (PAL) of 10 micrograms per liter and an Enforcement Standard (ES) of 50 micrograms per liter.]

## *We Need Your Help...*

If you have had experience with unexplained occurrences of THF, have conducted an investigation of THF, or have any suggestions for our study, please contact Waste Management staff Terry Hegeman at (920) 492-5796, or Janet Battista at (608) 267-3533. ✯✯

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